

Contribution to the Plecoptera fauna of North Macedonia

DÁVID MURÁNYI & TIBOR KOVÁCS

ABSTRACT: This paper provides 455 data of 63 taxa from 90 sampling sites collected between 06.1969 and 27.06.2024. *Zwicknia ephemera* sp. n. is described from a southeastern temporary stream. *Brachyptera phthiotica*, *Leuctra digitata*, *Nemoura aetolica*, *N. braaschi*, *Perla bureschi* and *Besdolus illyricus* are new to North Macedonia. Eleven taxa of uncertain taxonomical value are reported as confers (*Leuctra* cf. *mortoni*, *L.* cf. *pseudosignifera*, *Nemoura* cf. *bulgarica*, *N.* cf. *flexuosa*, *N.* cf. *peristeri*, *Protonemura* cf. *autumnalis*, *P.* cf. *illiesi*, *P.* cf. *nitida*, *Perla* cf. *pallida*, *Isoperla* cf. *russevi*, *I.* cf. *tripartita*). An updated and commented checklist of North Macedonian stoneflies is provided.

Introduction

The North Macedonian stonefly fauna is comparatively well known among Balkan countries, mainly due to the work of Petar Ikonomov during the seventies and eighties. In his faunistic summary (IKONOMOV 1986), 93 taxon were enumerated from the country. MURÁNYI *et al.* (2014) critically reviewed the previously reported taxa, counting 100 Macedonian stoneflies, together with four newly reported taxa. However, *Siphonoperla korab* Graf, 2012, described in GRAF *et al.* 2012 was left out from the list. Since then, five more species were firstly reported from the country: *Nemoura caligula* Zwick, 1978 and *Isoperla citrina* Murányi, 2011 in MURÁNYI *et al.* (2016), *Amphinemura standfussi* (Ris, 1902) in TYUFEKCHIEVA & RIMCHESKA (2019) *Isoperla vjosae* Graf & Vitecek, 2018 in RIMCHESKA & VIDINOVA (2021) and *Nemoura asceta* Murányi, 2007 in RUSITI-DAUTI *et al.* (2024).

In the present paper, we enumerate our own stonefly data collected in North Macedonia between 2006 and 2024, some additional specimens received from colleagues, and unpublished Serbian stonefly materials of the Hungarian Natural History Museum. The data are compiled in the updated checklist of North Macedonian Plecoptera.

Material and methods

For collecting methods of larvae see KOVÁCS *et al.* (1998). Exuviae were singled from stones, logs and riparian vegetation, adults were singled and/or beaten along running waters and collected at light. The localities are shown on Fig. 1.

The collected specimens have been preserved in 70% ethanol, and are deposited in the Department of Zoology, Eszterházy Károly Catholic University, Eger, Hungary (EKCÚ), the Collection of Smaller Insect Orders, Department of Zoology, Hungarian Natural History Museum, Budapest, Hungary (HNHM) and the Mátra Museum of the Hungarian Natural History Museum of the Hungarian National Museum Public Collection Centre, Gyöngyös, Hungary (MM).

Terminology of the new species description follows BOUMANS & MURÁNYI (2014). Illustrations were made with the aid of a drawing tube applied on a Nikon SMZ10 microscope. All images were adjusted and assembled into figures with Adobe Photoshop CC 2019.

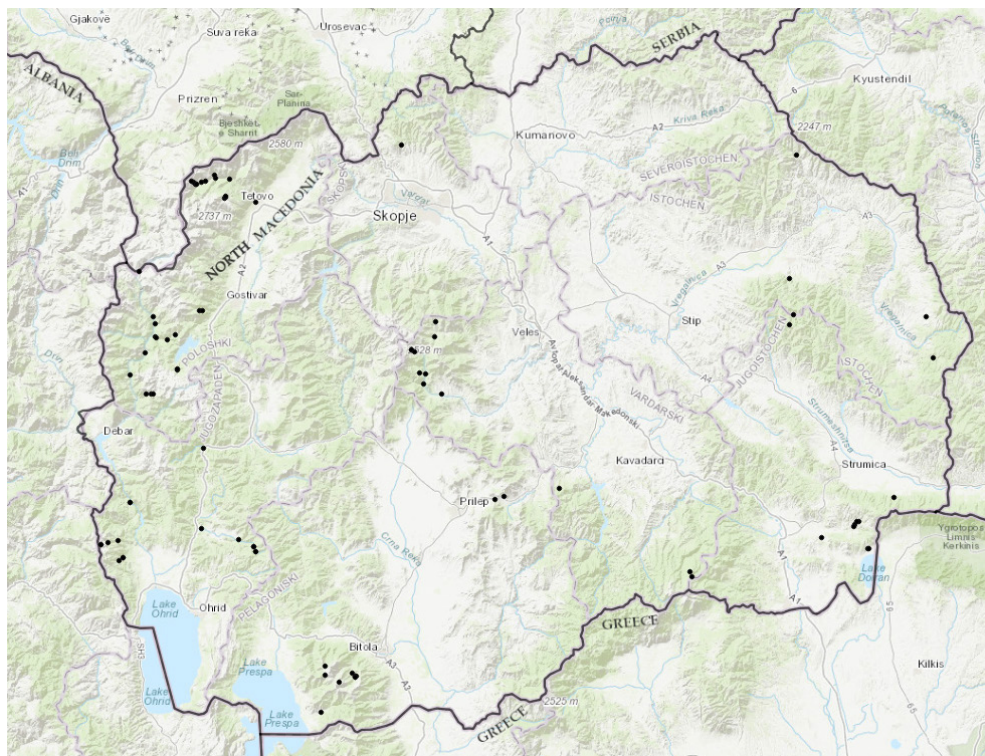


Fig. 1. Collecting sites in North Macedonia. ESRI World Topo Map

Abbreviations: Collectors – AA = András Ambrus, AD = Dorka Angyal, CSz = Szilvia Czigány, DL = László Dányi, FZ = Zoltán Fehér, HK = Krisztián Harmos, JP = Péter Juhász, KJ = Jenő Kontschán, KT = Tibor Kovács, MGy = György Makranczy, MD = Dávid Murányi, OP = Péter Olajos, PG = Gellért Puskás, SzT = Tímea Szederjesi, SzG = Gábor Szilágyi, UZs = Zsolt Ujvári; life stages – L = larva, E = exuvium, ♂ = male imago, ♀ = female imago.

Results

TAENIOPTERYGIDAE Klapálek, 1905

Brachyptera beali beali (Navás, 1924) – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Southwestern region, Izvor, Treska Spring, 760 m, N41.47710°, E20.81507°, 01.05.2021, KT, MD, OP, 1♀, (EKCÚ).

Brachyptera bulgarica Raušer, 1962 – IKONOMOV 1986 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 07.05.2014, KT, MD, 1♂, 1♀, (HNHM).

Brachyptera graeca Berthélemy, 1971 – IKONOMOV 1986 – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 27.04.2021, KT, MD, OP, 1E, (MM) – Polog region, Korab, Ničpur, Radika

River at the junction, 875 m, N41.745711°, E20.676103°, 08.04.2004, Z. Eröss, FZ, A. Hunyadi, 1♂, (HNHM) – Polog region, Šar Planina, Bozovce, open stream above the village, 1750 m, N42.05023°, E20.78765°, 26.04.2021, KT, MD, OP, 1E, 1♂, 1♀, (MM) – Polog region, Šar Planina, Veshala, Pena River beneath the village, 1100 m, N42.05821°, E20.84985°, 26.04.2021, KT, MD, OP, 1L, 3E, 1♂, 1♀, (EKCUC), 15L, (MM) – Polog region, Tetovo, at Sarena Džamija park, Pena River, 470 m, N42.0061°, E20.9673°, 26.04.2021, KT, MD, OP, 1♂, 1♀, (EKCUC) – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 1L, (EKCUC), 1L, 1E, (MM) – Southwestern region, Plakenska Planina, Brezani, Golema Stream, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 11L, 1♀, (EKCUC), 10L, (MM) – Southwestern region, Plakenska Planina, Brezani, Golema Stream, 1105 m, N41.25366°, E20.96785°, 01.05.2021, KT, MD, OP, 4L, (MM).

Brachyptera helenica Aubert, 1956 – IKONOMOV 1986 – Polog region, Bistra, Mavrovo, spring brooks above the village, 1285 m, N41.64724°, E20.74124°, 27.04.2021, KT, MD, OP, 2L, 1♂, (EKCUC) – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 27.04.2021, KT, MD, OP, 4L, (MM) – Polog region, Korab, Vrbjani, sidebrook of Radika River at the conjunction, 850 m, N41.68212°, E20.64774°, 16.05.2010, FZ, MD, UZs, 4L, 5♂, 7♀, (HNHM) – Polog region, Reka, Vrben, stream in the village, 1285 m, N41.72263°, E20.73626°, 16.05.2010, FZ, MD, UZs, 1♂, (HNHM) – Polog region, Šar Planina, Bozovce, forest brook above the village, 1440 m, N42.0507°, E20.8099°, 26.04.2021, KT, MD, OP, 2L, 1♂, (EKCUC) – Southwestern region, Jablanica, Vevcani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 2♂, (EKCUC), 1♂, 1♀, (MM) – Southwestern region, Jablanica, Vevcani, Vevcani Springs, 950 m, N41.23959°, E20.58418°, 28.04.2021, KT, MD, OP, 3L, (EKCUC) – Southwestern region, Lukovo, forest brook below the village, 615 m, N41.35856°, E20.60446°, 27.04.2021, KT, MD, OP, 4♂, 1♀, (EKCUC), 2♂, (MM) – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 3L, 2♂, (EKCUC), 1♂, (MM) – , Southwestern region, Plakenska Planina, Brezani, Golema Stream, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 1♀, (EKCUC), 1L, (MM).

Brachyptera macedonica Ikonov, 1983 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

Brachyptera phthiotica Berthélemy, 1971 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 07.05.2014, KT, MD, 3♂, (HNHM). – First record from North Macedonia, a souther Balkanian endemic.

Brachyptera risi (Morton, 1896) – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFKCHIEVA & RIMCHESKA 2019.

Brachyptera seticornis (Klapálek, 1902) – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 07.05.2014, KT, MD, 2♂, 1♀, (MM) – Polog region, Reka, Vrben, stream in the village, 1285 m, N41.72263°, E20.73626°, 16.05.2010, FZ, MD, UZs, 1♂, 1♀, (HNHM) – Polog region, Šar Planina, Bozovce, forest stream above the village, 1600 m, N42.04665°, E20.79376°, 26.04.2021, KT, MD, OP, 8L, (MM) – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 3♀, (HNHM), 1♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 2♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♂, (MM) – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 1♂, (MM).

Rhabdiopteryx doiranensis Ikonov, 1983 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

Rhabdiopteryx hamulata (Klapálek, 1902) – IKONOMOV 1986.

Rhabdiopteryx navicula Theischinger, 1974 – IKONOMOV 1986.

Rhabdiopteryx triangularis Braasch et Joost, 1972 – IKONOMOV 1986.

Taeniopteryx fusca Ikonov, 1980 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, open stream above the village, 1750 m, N42.05023°, E20.78765°, 26.04.2021, KT, MD, OP, 3♂, 6♀, (EKCUC), 1♂, 5♀, (MM).

Taeniopteryx hubaulti Aubert, 1946 – IKONOMOV 1986.

Taeniopteryx schoenemundi (Mertens, 1923) – IKONOMOV 1986, TYUFKCHIEVA & RIMCHESKA 2019.

Taeniopteryx stankovitchi Ikonov, 1978 – IKONOMOV 1986.

LEUCTRIDAE Klapálek, 1905

Leuctra balcanica Raušer, 1965 – IKONOMOV 1986.

Leuctra bronislawi Sowa, 1970 – IKONOMOV 1986, MURÁNYI *et al.* 2014 – Eastern region, Osogovska Planina, Sasa, sidebrook of Kamanka Stream above the village, 1010 m, N42.108410°, E22.525999°, 19.10.2006, DL, KJ, MD, 2♂, 5♀, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 02.10.2013, KT, MD, 1♀, (HNHM) – Polog region, Bistra Mts, Galičnik, fast, bushy brook in the village, 1395 m, N41°35.695', E20°39.050', 01.10.2013, KT, MD, 1♀, (MM) – Polog region, Šar

Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 2♂, 3♀, (HNHM) – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 1♀, (HNHM), 1♀, (MM) – Southeastern region, Belasica Mts, Bašibos, Anška River beneath at Kočuli settlement, 270 m, N41°18.507', E22°41.423', 04.10.2017, JP, KT, MD, 1♀, (MM) – Southeastern region, Belasica, Kolešino Waterfall, 460 m, N41.369453°, E22.806991°, 18.10.2006, DL, KJ, MD, 1♂, 2♀, (HNHM) – Southwestern region, Jablanica Mts, Labuništa, Labuništa brook, 1285 m, N41°16'34.4", E20°34'15.8", 14.09.2016, JP, KT, SzG, 2♂, 2♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Spring NW of the village, 1275 m, N41°41.417', E21°24.974', 03.10.2013, KT, MD, 1♂, (MM) – Vardar region, Jakupica Mts, Papradište, forest brook at the village, 970 m, N41°38.393', E21°26.359', 03.10.2013, KT, MD, 1♂, 1♀, (MM).

Leuctra cingulata Kempny, 1899 – IKONOMOV 1986.

Leuctra dalmoni Vinçon et Murányi, 2007 – VINÇON & MURÁNYI 2007, MURÁNYI *et al.* 2016 – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 25.06.2014, JP, KT, MD, 1♀, (HNHM); 07.05.2014, KT, MD, 6♂, 15♀, (HNHM), 8♂, 11♀, (MM) – Polog region, Bistra, Mavrovo, spring brooks above the village, 1285 m, N41.64724°, E20.74124°, 27.04.2021, KT, MD, OP, 1♂, (EKCU), 1♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♀, (MM) – Southwestern region, Jablanica, Vevčani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 1♀, (EKCU), 1♂, 2♀, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 1♂, 4♀, (MM).

Leuctra digitata Kempny, 1899 – Eastern region, Vlahina, Pehčevo, Ravna Stream above the village, 1055 m, N41.760900°, E22.901004°, 18.10.2006, DL, KJ, MD, 1♂, (HNHM). – First record from North Macedonia, a mostly North and Central European species.

Leuctra inermis Kempny, 1899 – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019 – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 1♀, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♂, 5♀, (HNHM), 1♂, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 07.05.2014, KT, MD, 4♂, 7♀, (MM) – Southwestern region, Jablanica, Vevčani, Vevčani Springs, 950 m, N41.23959°, E20.58418°, 28.04.2021, KT, MD, OP, 1♂, (MM) – Vardar region, Jakupica, Nežilovo, Babuna Spring, 1275 m, N41.6903°, E21.4162°, 08.07.2008, T. Deli, 1♀, (HNHM).

Leuctra fusca fusca (Linnaeus, 1758) – IKONOMOV 1986, MURÁNYI *et al.* 2014, TYUFEKCHIEVA & RIMCHESKA 2019 – Eastern region, Maleševu Mts, Berovo, forest stream above the Berovo Lake, 975 m, N41.671749°, E22.920837°, 18.10.2006, DL, KJ, MD, 1♀, (HNHM) – Eastern region, Plačkovica Mts, Lumen (Lomija) Stream beneath Mt. Li-sec, 1170 m, N41°45.858', E22°30.995', 05.10.2017, JP, KT, MD, 3♂, 5♀, (HNHM), 9♂, 11♀, (MM) – Eastern region, Plačkovica, Gradec, Gradec Stream above the village, 590 m, N41.843095°, E22.505991°, 19.10.2006, DL, KJ, MD, 2♂, 2♀, (HNHM) – Eastern region, Vlahina, Pehčevo, Ravna Stream above the village, 1055 m, N41.760900°, E22.901004°, 18.10.2006, DL, KJ, MD, 2♂, (HNHM) – Pelagonia region, Pelister, Brajčino, Brajčino Stream below the village, 985 m, N40.902269°, E21.156054°, 16.10.2006, DL, KJ, MD, 18♂, 13♀, (HNHM) – Pelagonia region, Pelister, Nižepole, Sapuncica Stream above the village, 1230 m, N40.988252°, E21.246407°, 17.10.2006, DL, KJ, MD, 7♂, 9♀, (HNHM) – Skopje region, Skopska Crna Gora, Banjane, Vrazanska Stream above the village, 635 m, N42.130325°, E21.388332°, 20.10.2006, DL, KJ, MD, 1♂, (HNHM) – Southeastern region, Belasica Mts, Bašibos, Anška River beneath at Kočuli settlement, 270 m, N41°18.507', E22°41.423', 04.10.2017, JP, KT, MD, 2♂, (HNHM), 2♂, 1♀, (MM) – Vardar region, Golešnica Mts, Gorno Jabolčište, forest stream above the village, 1035 m, N41°43.034', E21°29.040', 06.10.2017, JP, KT, MD, 1♂, 1♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Stream S of the village, 630 m, N41°38.238', E21°27.368', 03.10.2013, KT, MD, 4♂, (HNHM), 6♂, 1♀, (MM) – Vardar region, Jakupica, Kapinovo, Babuna River below the village, 460 m, N41.593488°, E21.504255°, 19.10.2006, DL, KJ, MD, 4♀, (HNHM) – Vardar region, Jakupica, Kapinovo, Babuna River below the village, 575 m, N41.615056°, E21.450804°, 19.10.2006, DL, KJ, MD, 17♂, 27♀, (HNHM).

Leuctra graeca Zwick, 1978 – MURÁNYI *et al.* 2014 – Southeastern region, Belasica Mts, Bašibos, Anška River beneath at Kočuli settlement, 270 m, N41°18.507', E22°41.423', 04.10.2017, JP, KT, MD, 9♂, 2♀, (HNHM), 13♂, 11♀, (MM) – Southeastern region, Belasica Mts, Bašibos, Činarli Stream N of the village, 355 m, N41°19.050', E22°41.983', 04.10.2017, JP, KT, MD, 3♂, 2♀, (HNHM).

Leuctra hippopoides Kačanski et Zwick, 1970 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, forest brook above the village, 1440 m, N42.0507°, E20.8099°, 26.04.2021, KT, MD, OP, 1♀, (EKCU) – Polog region, Šar Planina, Bozovce, open brook above the village, 1550 m, N42.04606°, E20.79354°, 26.04.2021, KT, MD, OP, 2♀, (EKCU) – Polog region, Trmica, Mavrovska Stream below the village, 955 m, N41.71717°, E20.67708°, 26.04.2021, KT, MD, OP, 2♀, (EKCU).

27.04.2021, KT, MD, OP, 1♀, (MM) – Southwestern region, Jablanica, Vevcani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 3♂, 2♀, intermediate specimens towards *L. hippopus*, (EKCUC), 4♂, 1♀, (MM).

Leuctra hippopus Kempny, 1899 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 07.05.2014, KT, MD, 2♂, 3♀, 1 male is a malformation, with tergal process on tergite VII similar to tergite VIII, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 2♂, (HNHM), 3♂, 1♀, (MM) – Polog region, Bistra, Mavrovo, spring brooks above the village, 1285 m, N41.64724°, E20.74124°, 27.04.2021, KT, MD, OP, 10♂, 3♀, (EKCUC), 1♀, (MM) – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 27.04.2021, KT, MD, OP, 2♂, 2♀, (EKCUC), 7♂, 6♀, (MM) – Polog region, Trnica, Mavrovska Stream below the village, 955 m, N41.71717°, E20.67708°, 27.04.2021, KT, MD, OP, 1E, 2♀, (MM) – Southwestern region, Lukovo, Crni Drim River below the village, 610 m, N41.3596°, E20.6038°, 27.04.2021, KT, MD, OP, 1♂, (EKCUC) – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 1♀, (MM) – Southwestern region, Plakenska Planina, Brezani, Golema Stream, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 2♀, (EKCUC), 1♀, (MM).

Leuctra hirsuta Bogoescu et Tabacaru, 1960 – IKONOMOV 1986, BEADINI *et al.* 2014 – Eastern region, Osogovska Planina, Sasa, sidebrook of Kamanica Stream above the village, 1010 m, N42.108410°, E22.525999°, 19.10.2006, DL, KJ, MD, 11♂, 6♀, (HNHM) – Eastern region, Plačkovica Mts, Lumen (Lomija) Stream beneath Mt. Lisec, 1170 m, N41°45.858", E22°30.995", 05.10.2017, JP, KT, MD, 3♂, (HNHM), 4♂, 11♀, (MM) – Pelagonia region, Babuna, Pletvar, forest brook E of Pletvar Pass, 845 m, N41.371680°, E21.682352°, 17.10.2006, DL, KJ, MD, 1♂, 2♀, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 02.10.2013, KT, MD, 3♂, 4♀, (HNHM), 3♂, 1 brachypterous, (MM) – Pelagonia region, Pelister, Brajčino, Brajčino Stream below the village, 985 m, N40.902269°, E21.156054°, 16.10.2006, DL, KJ, MD, 1♀, (HNHM) – Pelagonia region, Pelister, Nižepole, open brook at the ski course, 1370 m, N40.981434°, E21.253495°, 17.10.2006, DL, KJ, MD, 4♂, 4♀, (HNHM) – Pelagonia region, Pelister, Nižepole, Sapuncica Stream above the village, 1230 m, N40.988252°, E21.246407°, 17.10.2006, DL, KJ, MD, 19♂, 16♀, (HNHM) – Polog region, Bistra Mts, Galičnik, fast, bushy brook in the village, 1395 m, N41°35.695', E20°39.050', 01.10.2013, KT, MD, 4♂, 6♀, (HNHM), 11♂, 13♀, (MM) – Polog region, Bistra Mts, Galičnik, open brook E of the village, 1455 m, N41°35.637', E20°40.324', 01.10.2013, KT, MD, 3♂, 9♀, (HNHM), 4♂, 5♀, (MM) – Polog region, Korab, Ničpur, Radika River N of the village, 1080 m, N41.760163°, E20.669969°, 15.10.2006, DL, KJ, MD, 1♀, (HNHM) – Polog region, Šar Planina, Bozovce, seeps and woody pasture W (above) of the village, 1350 m, N42°03.125', E20°49.377', 01.10.2013, KT, MD, 1♂, (MM) – Polog region, Šar Planina, Gorno Jelovce, forest spring S of the village, 1125 m, N41.772892°, E20.813212°, 15.10.2006, DL, KJ, MD, 1♂, 1♀, (HNHM) – Polog region, Šar Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 4♂, 4♀, (HNHM) – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 5♂, 9♀, (HNHM), 1♂, 9♀, (MM) – Polog region, Trnica, Mavrovska River E (above) of the village, 1110 m, N41.711781°, E20.711623°, 15.10.2006, DL, KJ, MD, 1♂, 7♀, (HNHM) – Skopje region, Skopska Crna Gora, Banjane, Vrazanska Stream above the village, 635 m, N42.130325°, E21.388332°, 20.10.2006, DL, KJ, MD, 1♀, (HNHM) – Southeastern region, Belasica, Kolečino, Kolečino Waterfall, 460 m, N41.369453°, E22.806991°, 18.10.2006, DL, KJ, MD, 13♂, 8♀, (HNHM) – Southeastern region, Dojransko Basin, Nikolić, macchia brook W of the village, 215 m, N41°15.546', E22°44.037', 04.10.2013, KT, MD, 6♂, 7♀, (MM) – Southeastern region, Plačkovica Mts, forest brook beneath by Beli Kamen, 1335 m, N41°44.672', E22°30.356', 05.10.2017, JP, KT, MD, 8♂, 10♀, (HNHM), 23♂, 28♀, (MM) – Southwestern region, Jablanica Mts, Labuništa, Labuništa brook, 1285 m, N41°16'34.4", E20°34'15.8", 14.09.2016, JP, KT, SgZ, 12♂, 12♀, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♀, (MM); 10.10.2014, JP, KT, PG, 17♂, 20♀, (MM) – Vardar region, Golešnica Mts, Gorno Jabolčište, forest brook and open brook N of the village, 1285 m, N41°44.951', E21°29.230', 06.10.2017, JP, KT, MD, 24♂, 20♀, (HNHM), 35♂, 25♀, (MM) – Vardar region, Golešnica Mts, Gorno Jabolčište, forest stream above the village, 1035 m, N41°43.034', E21°29.040', 06.10.2017, JP, KT, MD, 1♂, (HNHM), 1♂, 2♀, (MM) – Vardar region, Jakupica Mts, Kapinovo, Babuna River below the village, 575 m, N41.615056°, E21.450804°, 19.10.2006, DL, KJ, MD, 2♂, 2♀, (HNHM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Spring NW of the village, 1275 m, N41°41.417', E21°24.974', 03.10.2013, KT, MD, 2♀, (HNHM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Stream S of the village, 630 m, N41°38.238', E21°27.368', 03.10.2013, KT, MD, 2♂, 2♀, (HNHM), 3♂, 2♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, forest brook NW of the village, 1140 m, N41°41.061', E21°25.466', 03.10.2013, KT, MD, 1♂, (HNHM), 1♂, 1♀, (MM) – Vardar region, Jakupica Mts, Papradište, forest brook at the

village, 970 m, N41°38.393', E21°26.359', 03.10.2013, KT, MD, 13♂, 10♀, (HNHM), 18♂, 14♀, (MM).

Leuctra major Brinck, 1949 – IKONOMOV 1986 – Eastern region, Osogovska Planina, Sasa, sidebrook of Kamanica Stream above the village, 1010 m, N42.108410°, E22.525999°, 19.10.2006, DL, KJ, MD, 1♂, (HNHM) – Pelagonia region, Pelister, Nižepole, Sapunica Stream above the village, 1230 m, N40.988252°, E21.246407°, 17.10.2006, DL, KJ, MD, 1♂, (HNHM) – Polog region, Šar Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 1♀, (HNHM) – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 1♀, (MM) – South-eastern region, Belasica, Kolečino, Kolečino Waterfall, 460 m, N41.369453°, E22.806991°, 18.10.2006, DL, KJ, MD, 4♂, 3♀, (HNHM).

Leuctra metsovnica Aubert, 1956 – IKONOMOV 1986, MURÁNYI *et al.* 2016, 2021 – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 25.06.2014, JP, KT, MD, 1♂, 1♀, (MM) – Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, 1905 m, N41°16.069', E20°31.242', 26.06.2014, JP, KT, MD, 1L, 12♂, 12♀, (HNHM), 21♂, 19♀, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 07.05.2014, KT, MD, 3♀, (HNHM); 26.06.2014, JP, KT, MD, 1♂, 6♀, (MM) – Southwestern region, Jablanica, Vevčani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 1♀, (EKCUC), 1♀, (MM) – Southwestern region, Jablanica, Vevčani, Vevčani Springs, 950 m, N41.23959°, E20.58418°, 28.04.2021, KT, MD, OP, 1♀, (EKCUC).

Leuctra mortoni Kempny, 1899 – IKONOMOV 1986 – Polog region, Šar Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 4♀, (HNHM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♀, (MM); 10.10.2014, JP, KT, PG, 10♂, 10♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Spring NW of the village, 1275 m, N41°41.417'', E21°24.974', 03.10.2013, KT, MD, 6♂, 2♀, (HNHM), 4♂, 6♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, forest brook NW of the village, 1140 m, N41°41.061', E21°25.466', 03.10.2013, KT, MD, 1♀, (HNHM).

Leuctra cf. mortoni Kempny, 1899 – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 03.10.2017, JP, KT, MD, 31♂, 26♀, (HNHM), 24♂, 17♀, (MM) – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 13.09.2016, JP, KT, SzG, 22♂, 18♀, (MM) – Pelagonia region, Pelister Mts, Dva Groba, spring of Maloviška Stream, 2060 m, N40°59.113', E21°10.100', 03.10.2017, JP, KT, MD, 15♂, 20♀, (HNHM), 16♂, 13♀, (MM) – Pelagonia region, Pelister Mts, spring area of Ezerska Stream beneath Golemo Ezero, 2200 m, N40°58.142', E21°12.431', 03.10.2017, JP, KT, MD, 25♂, 18♀, (HNHM), 45♂, 18♀, (MM) – Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, 1905 m, N41°16.069', E20°31.242', 10.10.2014, JP, KT, PG, 39♂, 12♀, (MM). – Taxonomic value of these populations is in need of further studies. They surely not belong to *Leuctra mortoni feheri* Murányi, 2007, the Central-southern Balkanian subspecies, but neither the nominal subspecies.

Leuctra nigra (Olivier, 1811) – IKONOMOV 1986.

Leuctra olympia Aubert, 1956 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

Leuctra prima Kempny, 1899 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, open stream above the village, 1750 m, N42.05023°, E20.78765°, 26.04.2021, KT, MD, OP, 13♂, 23♀, (EKCUC), 9♂, 19♀, (MM).

Leuctra pseudosignifera Aubert, 1964 – IKONOMOV 1986.

Leuctra cf. pseudosignifera Aubert, 1954 – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6'', E20°58'2.6'', 01.05.2021, KT, MD, OP, 1♂, (EKCUC), 2♂, 2♀, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 2♀, (HNHM). – These populations are not agreed with the real *Leuctra pseudosignifera* as redefined by VINÇON & MURÁNYI 2007, and probably represent an undescribed species.

Leuctra pseudohippopus Raušer, 1965 – IKONOMOV 1986, MURÁNYI *et al.* 2016 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 07.05.2014, KT, MD, 2♂, (HNHM), 2♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1♀, (HNHM), 1♂, (MM); 25.06.2014, JP, KT, MD, 1♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♀, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 5♂, 4♀, (HNHM), 18♂, 4♀, (MM); 25.06.2014, JP, KT, MD, 1♀, (MM).

Leuctra quadrimaculata Kis, 1963 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 1♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 2♂, (MM).

Leuctra rauscheri Aubert, 1957 – IKONOMOV 1986.

Leuctra rosinae Kempny, 1900 – IKONOMOV 1986.

Capnia nigra (Pictet, 1839) – IKONOMOV 1986.

Capnia vidua rilensis Raušer, 1962 – IKONOMOV 1986.

Capnioneura balkanica macedonica Ikonomov, 1978 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

Capnioneura valandovi Ikonomov, 1978 – MURÁNYI *et al.* 2014, 2016.

Capnopsis schilleri balcanica Zwick, 1984 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

Zwickyia acuta Murányi & Orci, 2014 – MURÁNYI *et al.* 2014, 2016.

Zwickyia bifrons (Newmann, 1839) – IKONOMOV 1986, RIMCHESKA & VIDINOVA 2021.

Zwickyia ephemera sp. n. (Figs 2–10)

Zwickyia sp. – MURÁNYI *et al.* 2014: 71. (faunistic data of the actual type specimens).

Zwickyia sp. n. – MURÁNYI *et al.* 2016: 75. (report of the same specimens, as part of the co-existing fauna of *Isoperla pesici*).

Type material – Holotype male: **North Macedonia**, Southeastern region, Valandovsko Polje, Dedeli, temporary macchia brook W of the village, 160 m, N41.2826°, E22.5986°, 21.02.2014, leg. AD, DL, KT, MD (HNHM: PLP4605; drumming recorded, sequenced for Co1); Paratypes: same locality and data: 1♂ 1♀ (HNHM: PLP4604; female sequenced for Co1), 1♂ 2♀ (MM: 2014-35, PLETYP-41); same locality, 15.03.2008, leg. CSz, MD: 2♀ (HNHM: PLP2549).

Diagnosis – Male brachypterous to micropterous, ventral vesicle more than half as wide as the subgenital plate. Main epiproct sclerite: narrow and blunt in dorsal view, short and medially raised in lateral view; apex straight, moderately acute in lateral view with ventral edge slightly undulated, apical spines stout; ventral membranous section short, ends half way before the base in lateral view. Process of male tergite 9: high, perpendicularly raised, twice as wide as main epiproct sclerite, trapezoid with wider base, and with sides not or just slightly indenting in caudal view.

Description – Head, thorax, appendages and basal segments of the abdomen as is typical for the genus. Setation moderately long. Males brachypterous (Fig. 9) to micropterous, females macropterous. Body length: holotype 5.5 mm, male paratypes 5.0–6.0, females 7.5–8.5 mm; forewing length: holotype 2.0 mm, male paratypes 1.0–2.0 mm, females 7.0–8.5 mm.

Male terminalia (Figs 2–7): Process of tergite 9 high, perpendicularly elevated, its apex is twice as wide as the medial section of the main epiproct sclerite; its shape is trapezoid with wider base, the apex rounded with two inconspicuous, hump-like tips; sides not indented in caudal view, the membranous portion narrowest apically. Tergite 10, basal and laterobasal epiproct sclerites as is typical for the genus. Main epiproct sclerite relatively narrow and blunt in dorsal view, medially slightly swollen, its medial width is more than half of basal width; in lateral view, short and regularly curved, the portion behind apex raised. Apex straight and moderately acute in lateral view, ventral edge slightly undulated, divided section moderately long. Ventral membranous part between the left and right divisions of the main epiproct sclerite short, ends half way before the base in lateral view; apical spines stout, distributed on the membranous part with a few spines occurring on the sclerite. Inner sclerite as is typical for the genus, eversible crest moderately long. Sternite 9 slightly projecting medially, vesicle rather large, wider than long, more than half as wide as the subgenital plate. Subgenital plate with rounded triangular shape, tip small and rounded. Paraprocts with wide tip; fusion plate, retractoral plate and cerci as is typical for the genus.

Female terminalia (Fig. 8): Subgenital plate entirely dark, posterior edge widely rounded with slight medial indentation. Lateral and ventral sclerites as is typical for the genus.

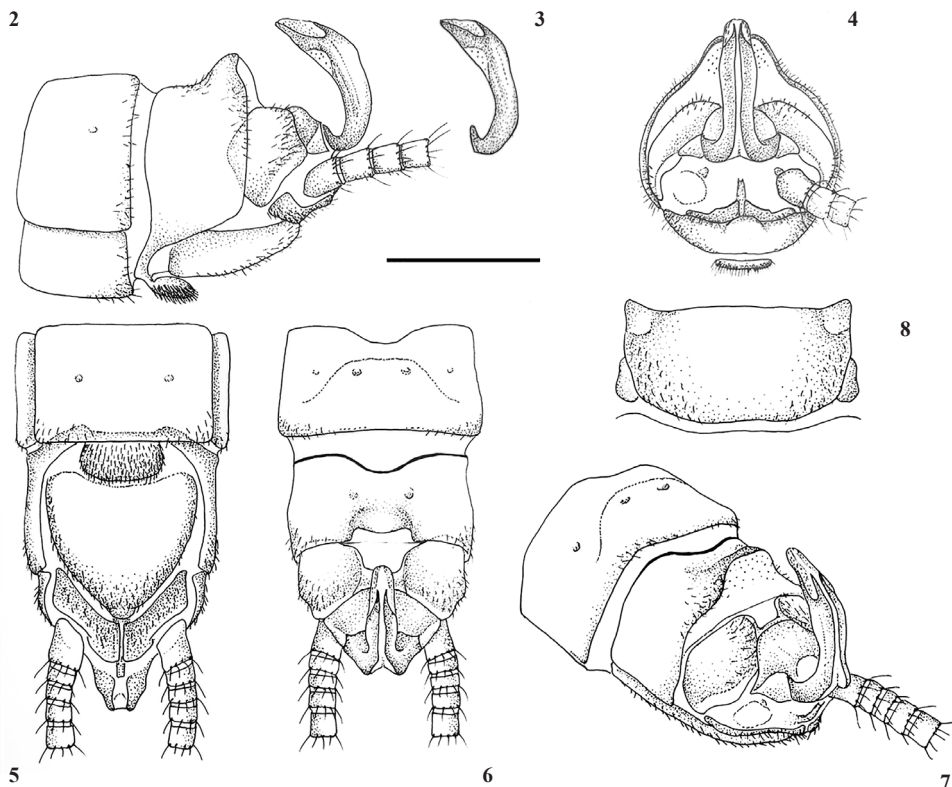
Variability – One of the male paratypes (MM) is having 1 mm long micropterous wing, and its main epiproct sclerite is less raised in lateral view (Fig. 3). However, other characters of the terminalia fully agree with the holotype and the other paratype, so their conspecificity is very likely.

Affinities – Males of the species can be distinguished from congeners on the basis of large ventral vesicle, and details of the tergal process and main epiproct sclerite. The shape and proportions of tergal process similar to the Asian species, especially of *Z. sevanica* (Zhiltzova, 1964) and *Z. turkestanica turkestanica* (Kimmins, 1951). The main epiproct sclerite differs from all congeners by the combination of three characters: apex laterally straight with slightly undulated ventral edge, ventral membranous section short, and the medial portion is raised in lateral view. Most *Zwicknia* females are morphologically indistinguishable, with the exception of two distinctive species: *Z. tuberculata* (Zhiltzova, 1964) (subgenital plate with longitudinal medial lines) and *Z. gattolliati* Vinçon & Reding, 2018 (long setation).

Drumming – Male drumming signal was recorded only for the holotype. It is the closest to the call of *Z. acuta* Murányi & Orci, 2014, and will be described in details in a further paper in preparation (Orci K. M., pers. comm.).

Distribution and ecology – The species was found at a single, low elevation temporary brook of the Valandovsko Polje (Fig. 10). The brook runs in rocky macchia, has rocky and sandy substrate, and the water was only a few centimeters deep and less than one meter wide when the species emerges. It joins a larger, rocky stream at the collecting site, but all males and most females were collected along the smaller brook. Both waterflows dry up by May, and remains dry until November. We visited the habitat several times, and found seven coexisting species (MURÁNYI *et al.* 2014, 2016: *Brachyptera beali beali*, *B. macedonica*, *Rhabdiopteryx doiranensis*, *Capnopsis schilleri balcanica*, *Protonemura rauschi*, *Nemoura subtilis*, *Isoperla pesici*).

Etymology – The name *ephemera*, the neuter plural of the modern word originated from the Greek *epi* (ἐπί) – “on, for” and *hemera* (ἡμέρα) – “day”, refers on the habitat of the new species.



Figs 2–8. *Zwicknia ephemera* sp. n. – **Figs 2, 4–7** holotype, **Figs 3, 8** paratypes – **Fig. 2.** male terminalia, lateral view; **Fig. 3.** male epiproct tip, lateral view; **Fig. 4.** male terminalia, caudal view; **Fig. 5.** same, ventral view; **Fig. 6.** same, dorsal view; **Fig. 7.** same, oblique view; **Fig. 8.** female subgenital plate, ventral view (scale 0.5 mm)



Figs 9–10. Habitus and habitat of *Zwicknia ephemera* sp. n. (photos: 9 – G. Puskás, 10 – D. Murányi)

Amphinemura quadrangularis Zwick, 1978 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016

Amphinemura sulcicollis (Stephens, 1835) – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019.

Amphinemura standfussi (Ris, 1902) – TYUFEKCHIEVA & RIMCHESKA 2019.

Amphinemura triangularis (Ris, 1902) – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019 – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♂, 2♀, (HNHM), 1♂, 9♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♀, (HNHM), 2♀, (MM) – Polog region, Trnica, Mavrovska Stream below the village, 955 m, N41.71717°, E20.67708°, 27.04.2021, KT, MD, OP, 1♂, (MM) – Southeastern region, Dojran Lake basin, Nikolik, macchia brook W of the village, 250 m, N41.2592°, E22.7327°, 15.03.2008, CSz, MD, 1L, (HNHM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♀, (MM).

Nemoura aetolica Zwick, 1978 – Vardar region, Kjesendre, along the road to Galiste, forest brook, 680 m, N41.3904°, E21.8409°, 25.04.2019, FZ, DL, MGy, SzT, 2♂, (EKCUC). – First record from North Macedonia, a souther Balkanian endemic.

Nemoura anas Murányi, 2007 – MURÁNYI 2007 – Polog region, Bistra Mts, Galičnik, fast, bushy brook in the village, 1395 m, N41°35.695', E20°39.050', 01.10.2013, KT, MD, 1♀, (MM) – Southwestern region, Jablanica Mts, Labuništa, Labuništa brook, 1285 m, N41°16'34.4", E20°34'15.8", 14.09.2016, JP, KT, SzG, 3♀, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 10.10.2014, JP, KT, PG, 1♂, 1♀, (MM).

Nemoura asceta Murányi, 2007 – RUŠITI-DAUTI *et al.* 2024.

Nemoura braaschi Joost, 1970 – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 2♂, 1♀, (HNHM). – First record from North Macedonia, an eastern Balkanian endemic.

Nemoura cf. *bulgarica* Raušer, 1962 – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♂, (MM). – A new species that will be described in an ongoing revision of the *Nemoura bulgarica* species group.

Nemoura caligula Zwick, 1978 – MURÁNYI *et al.* 2016 – Polog region, Bistra, Mavrovo, spring brooks above the village, 1285 m, N41.64724°, E20.74124°, 27.04.2021, KT, MD, OP, 1♂, (EKCUC) – Southwestern region, Jablanica, Vevčani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 2♂, 1♀, (EKCUC), 9♂, 4♀, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 1♂, (MM).

Nemoura cinerea cinerea (Retzius, 1783) – IKONOMOV 1986, MURÁNYI *et al.* 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Babuna, Pletvar, Pletvar Pass, 900–1200 m, N41.365975°, E21.656911°, 11.05.1971, J. Papp, S. Horvatovich, 3♂, 5♀, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1♂, (MM); 25.06.2014, JP, KT, MD, 2♀, (HNHM), 2♂, 3♀, (MM) – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 1♂, 1♀, (MM) – Polog region, Šar Planina, Bozovce, open brook above the village, 1550 m, N42.04606°, E20.79354°, 26.04.2021, KT, MD, OP, 4L, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♂, 1♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 3L, 1♂, 3♀, (HNHM), 2♀, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 1♂, 5♀, (MM) – Southwestern region, Belcista, large stream W of the village, 760 m, N41.3020°, E20.8110°, 01.05.2021, KT, MD, OP, 1♂, 2♀, (EKCUC) – Southwestern region, Izvor, Treska Spring, 760 m, N41.47710°, E20.81507°, 01.05.2021, KT, MD, OP, 4L, 1♀, (EKCUC), 12L, (MM) – Southwestern region, Lukovo, Crni Drim River below the village, 610 m, N41.3596°, E20.6038°, 27.04.2021, KT, MD, OP, 1L, (EKCUC) – Southwestern region, Plakenska Planina, Brežani, Golema Stream, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 1L, (EKCUC) – Southwestern region, Plakenska Planina, Brežani, spring above the village, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 3L, (MM) – Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 25.06.2014, JP, KT, MD, 1♂, (MM) – Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, 1660 m, N41°12.565', E22°13.158', 25.06.2014, JP, KT, MD, 1L, 1♂, 2♀, (HNHM), 2♂, 5♀, (MM).

Nemoura flexuosa Aubert, 1949 – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019.

Nemoura cf. *flexuosa* Aubert, 1949 – Southwestern region, Jablanica, Vevčani, Vevčani Springs, 950 m, N41.23959°, E20.58418°, 28.04.2021, KT, MD, OP, 1♂, (MM). – A population morphologically distinct from *Nemoura flexuosa*,

its taxonomic value must be confirmed by molecular studies.

Nemoura illiesi Mendel, 1968 – IKONOMOV 1986.

Nemoura longicauda Kis, 1964 – IKONOMOV 1986.

Nemoura banatica Kis, 1965 – IKONOMOV 1986 – According to VINÇON *et al.* 2024, previous Balkanian records of *Nemoura marginata* Pictet, 1836 refers on *N. banatica*.

Nemoura peristeri Aubert, 1963 – IKONOMOV 1986, MURÁNYI *et al.* 2016 – Pelagonia region, Pelister Mts, 2300 m, 02.07.1977, I. Sivec, 2♂, 2♀, (HNHM) – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 13.09.2016, JP, KT, SzG, 3♂, 7♀, (MM); 03.10.2017, JP, KT, MD, 8L, 17♂, 23♀, (HNHM), 10 ♂, 22 ♀, (MM) – Pelagonia region, Pelister Mts, Dva Groba, spring of Maloviška Stream, 2060 m, N40°59.113', E21°10.100', 03.10.2017, JP, KT, MD, 1♂, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, open brook and seep above the ski station, 1440 m, N40°58.877', E21°15.450', 02.10.2013, KT, MD, 2♂, (HNHM), 8♂, 6♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 02.10.2013, KT, MD, 2♂, 1♀, (HNHM), 9♂, 4♀, (MM) – Pelagonia region, Pelister Mts, spring area of Ezerska Stream beneath Golemo Ezero, 2200 m, N40°58.142', E21°12.431', 03.10.2017, JP, KT, MD, 3♂, 1♀, (MM).

Nemoura cf. *peristeri* Aubert, 1963 – Southwestern region, Plakenska Planina, Brežani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 27.06.2024, AA, HK, KT, 2♂, 1♀, (MM). – A long winged population, distinctly different from *N. anas* and more similar to the brachypterous *N. peristeri*. Taxonomic value must be confirmed by molecular studies.

Nemoura subtilis Klapálek, 1895 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 25.06.2014, JP, KT, MD, 1♂, 1♀, (HNHM), 1♂, 1♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1♂, 3♀, (HNHM), 5♂, 3♀, (MM) – Southeastern region, Valandovsko Polje, Dedeli, temporary macchia brook W of the village, 150 m, N41°17.036', E22°35.905', 15.03.2008, CSz, MD, 1L, (HNHM) – Vardar region, Kjesendre, along the road to Galiste, forest brook, 680 m, N41.3904°, E21.8409°, 25.04.2019, FZ, DL, MGy, SzT, 1♂, (EKCUC) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 1♂, (HNHM).

Nemoura uncinata Despax, 1934 – IKONOMOV 1986: as „*Nemoura fulviceps* Klapálek, 1902", MURÁNYI *et al.* 2016, TYUFEKCHIEVA & RIMCHESKA 2019, RUŠITI-DAUTI *et al.* 2024 – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 3♂, (MM) – Polog region, Šar Planina, Bozovce, open brook above the village, 1550 m, N42.04606°, E20.79354°, 26.04.2021, KT, MD, OP, 1♂, (EKCUC) – Southwestern region, Jablanica, Labunista, Lenista, open brook, 1650 m, N41.27299°, E20.53986°, 27.04.2021, KT, MD, OP, 1♂, 1♀, (EKCUC), 1♂, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 1♂, (MM).

Nemoura zwicki Sivec, 1979 – IKONOMOV 1986.

Nemurella pictetii Klapálek, 1900 – IKONOMOV 1986, MURÁNYI *et al.* 2016 – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1♂, 2♀, (MM) – Polog region, Šar Planina, Bozovce, open brook above the village, 1550 m, N42.04606°, E20.79354°, 26.04.2021, KT, MD, OP, 1L, (MM) – Southwestern region, Izvor, Treska Spring, 760 m, N41.47710°, E20.81507°, 01.05.2021, KT, MD, OP, 18L, 1♂, 1♀, (MM) – Southwestern region, Plakenska Planina, Brežani, spring above the village, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 1L, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 1♂, (MM) – Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, 1660 m, N41°12.565', E22°13.158', 06.05.2014, KT, MD, 1♂, 2♀, (HNHM), 3♂, 1♀, (MM).

Protonemura aestiva Kis, 1965 – IKONOMOV 1986.

Protonemura autumnalis Raušer, 1956 – IKONOMOV 1986 – Polog region, Šar Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 1E, 1♂, 2♀, (HNHM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 07.05.2014, KT, MD, 5♀, (HNHM).

Protonemura cf. *autumnalis* Raušer, 1956 – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 1♂, 2♀, (MM). – Taxonomy of the *Protonemura nitida* group is a certain problem in the Balkans. This population is morphologically close to *P. autumnalis*, but probably belong to an unnamed species.

Protonemura hrabei Raušer, 1956 – IKONOMOV 1986, MURÁNYI *et al.* 2016 – Eastern region, Osogovska Planina, Sasa, sidebrook of Kamanica Stream above the village, 1010 m, N42.108410°, E22.525999°, 19.10.2006, DL, KJ, MD, 1♀, (HNHM) – Eastern region, Plačkovica Mts, Lumen (Lomija) Stream beneath Mt. Lisec, 1170 m,

N41°45.858', E22°30.995', 05.10.2017, JP, KT, MD, 1♂, (MM) – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 13.09.2016, JP, KT, SzG, 8♂, 8♀, (MM); 03.10.2017, JP, KT, MD, 4L, 1E, 19♂, 21♀, (HNHM) – Pelagonia region, Pelister Mts, Dva Groba, spring of Maloviška Stream, 2060 m, N40°59.113', E21°10.100', 03.10.2017, JP, KT, MD, 10♂, 5♀, (HNHM), 11♂, 8♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook and seep above the ski station, 1440 m, N40°58.877', E21°15.450', 02.10.2013, KT, MD, 1♂, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 02.10.2013, KT, MD, 1L, 4♂, 1♀, (HNHM), 4♂, 4♀, (MM) – Pelagonia region, Pelister Mts, spring area of Ezerska Stream beneath Golemo Ezero, 2200 m, N40°58.142', E21°12.431', 03.10.2017, JP, KT, MD, 6♂, 2♀, (HNHM), 9♂, 8♀, (MM) – Pelagonia region, Pelister, Nižepole, open brook at the ski course, 1375 m, N40.979796°, E21.253628°, 17.10.2006, DL, KJ, MD, 1E, 12♂, 7♀, (HNHM) – Polog region, Bistra Mts, Galičnik, fast, bushy brook in the village, 1395 m, N41°35.695', E20°39.050', 01.10.2013, KT, MD, 1♀, (HNHM) – Polog region, Šar Planina, Gorno Jelovce, forest spring S of the village, 1125 m, N41.772892°, E20.813212°, 15.10.2006, DL, KJ, MD, 1♂, 1♀, (HNHM) – Polog region, Šar Planina, Gorno Jelovce, forest stream S of the village, 1170 m, N41.774761°, E20.803922°, 15.10.2006, DL, KJ, MD, 1♀, (HNHM) – Polog region, Šar Planina, left side brook of Radika Reka, 1550 m, N41°51'26.9", E20°37'50.8", 15.09.2016, JP, KT, SzG, 2♂, 1♀, (MM) – Polog region, Šar Planina, Popova Sapka, open brook, 1795 m, N42.015206°, E20.876735°, 15.10.2006, DL, KJ, MD, 2L, 3E, 5♂, 9♀, (HNHM) – Polog region, Šar Planina, Popova Sapka, open stream, 1780 m, N42.017650°, E20.880481°, 15.10.2006, DL, KJ, MD, 1♂, 1♀, 1gy♀, 1 female gynandromorph, (HNHM) – Skopje region, Skopska Crna Gora, Banjane, Vrazanska Stream above the village, 635 m, N42.130325°, E21.388332°, 20.10.2006, DL, KJ, MD, 1♀, (HNHM) – Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, 1905 m, N41°16.069', E20°31.242', 10.10.2014, JP, KT, PG, 22♂, 29♀, (MM) – Vardar region, Golešnica Mts, Gorno Jabolčište, forest brook and open brook N of the village, 1285 m, N41°44.951', E21°29.230', 06.10.2017, JP, KT, MD, 1E, 1♂, 2♀, (HNHM), 3♂, (MM).

Protonemura illiesi Kis, 1963 – IKONOMOV 1986.

Protonemura cf. *illiesi* Kis, 1963 – Eastern region, Vlahina, Pehčevo, Ravna Stream above the village, 1055 m, N41.760900°, E22.901004°, 18.10.2006, DL, KJ, MD, 1♀, (HNHM). – Morphologically close to, but still different from *Protonemura illiesi*. Taxonomic value of the population must be confirmed by molecular studies.

Protonemura intricata intricata (Ris, 1902) – IKONOMOV 1986, MURÁNYI *et al.* 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 25.06.2014, JP, KT, MD, 1♂, 2♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 25.06.2014, JP, KT, MD, 1♀, (HNHM), 1♂, 2♀, (MM) – Polog region, Reka, Vrben, stream in the village, 1285 m, N41.72263°, E20.73626°, 16.05.2010, FZ, MD, UZs, 1♀, (HNHM) – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 4♂, 1♀, (HNHM), 5♂, 3♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 3♂, 4♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♀, (HNHM), 5♀, (MM) – Polog region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, 980 m, N42°03.375', E20°53.561', 24.06.2014, JP, KT, MD, 1♀, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 2♀, (MM) – Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 25.06.2014, JP, KT, MD, 1♀, (MM).

Protonemura mattheyi Aubert, 1956 – IKONOMOV 1986.

Protonemura miatchense Ikonov, 1983 – IKONOMOV 1986 – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 07.05.2014, KT, MD, 1♂2♀, (HNHM), 1♂, 2♀, (MM) – Southwestern region, Jablanica, Vevčani, Vevčani Springs, 950 m, N41.23959°, E20.58418°, 28.04.2021, KT, MD, OP, 2♂, 4♀, (EKC), 3♂, 5♀, (MM).

Protonemura montana Kimmins, 1941 – IKONOMOV 1986 – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 10.10.2014, JP, KT, PG, 2♂, 11♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Spring NW of the village, 1275 m, N41°41.417', E21°24.974', 03.10.2013, KT, MD, 1♂, 4♀, (HNHM), 11♂, 5♀, (MM).

Protonemura nitida (Pictet, 1836) – IKONOMOV 1986.

Protonemura cf. *nitida* (Pictet, 1836) – Eastern region, Plačkovica Mts, Lumen (Lomija) Stream beneath Mt. Lisec, 1170 m, N41°45.858', E22°30.995', 05.10.2017, JP, KT, MD, 2♂, (HNHM), 2♂, 2♀, (MM) – Pelagonia region, Pelister, Nižepole, Sapunica Stream above the village, 1230 m, N40.988252°, E21.246407°, 17.10.2006, DL, KJ, MD, 1♀, (HNHM) – Polog region, Bistra Mts, Galičnik, fast, bushy brook in the village, 1395 m, N41°35.695', E20°39.050', 01.10.2013, KT, MD, 1♂, (MM) – Polog region, Šar Planina, left side brook of Radika Reka, 1550 m,

N41°51'26.9", E20°37'50.8", 15.09.2016, JP, KT, SzG, 1♂, (MM) – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 2♂, 2♀, (HNHM) – Southeastern region, Belasica, Kolečino, Kolečino Waterfall, 460 m, N41.369453°, E22.806991°, 18.10.2006, DL, KJ, MD, 2♂, 1♀, (HNHM) – Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, 1905 m, N41°16.069', E20°31.242', 10.10.2014, JP, KT, PG, 10♂, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 10.10.2014, JP, KT, PG, 1♂, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Spring NW of the village, 1275 m, N41°41.417', E21°24.974', 03.10.2013, KT, MD, 3♀, (HNHM), 11♂, 2♀, (MM) – Vardar region, Jakupica Mts, Nežilovo, Babuna Stream S of the village, 630 m, N41°38.238', E21°27.368', 03.10.2013, KT, MD, 3♂, (MM). – Similar case to *Protonemura cf. autumnalis*: molecular studies are needed to clarify its taxonomic value.

Protonemura praecox praecox (Morton, 1894) – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1♀, (MM) – Polog region, Šar Planina, Bozovce, forest stream above the village, 1600 m, N42.04665°, E20.79376°, 26.04.2021, KT, MD, OP, 2L, (MM) – Polog region, Šar Planina, Bozovce, open stream above the village, 1750 m, N42.05023°, E20.78765°, 26.04.2021, KT, MD, OP, 6♂, 2♀, (EKCU), 2L, 10♂, 9♀, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 2♀, (MM).

Protonemura rauschi Theischinger, 1975 – IKONOMOV 1986, MURÁNYI *et al.* 2014, 2016.

PERLIDAE Latreille, 1802

Dinocras megacephala (Klapálek, 1907) – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019 – Polog region, Bistra, Galicnik, stream E of the village, 1435 m, N41.59358°, E20.66599°, 01.07.2010, Z. Barina, D. Pifkó, 18♀, (HNHM) – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 28.06.2012, AA, 4E, 2♀, (MM) – Polog region, Šar Planina, Veshala, Pena River beneath the village, 1100 m, N42.05821°, E20.84985°, 26.04.2021, KT, MD, OP, 4L, (MM) – Polog region, Trebište, Radika River, 720 m, N41°38'08.2", E20°36'17.3", 01.07.2012, AA, 3E, 1♂, (MM) – Polog region, Trnica, Mavrovska River at the village, 965 m, N41°42.960', E20°40.738', 01.07.2018, JP, KT, MD, 8♀, (HNHM) – Polog region, Trnica, Mavrovska Stream below the village, 955 m, N41.71717°, E20.67708°, 27.04.2021, KT, MD, OP, 7L, (MM).

Eoperla ochracea (Kolbe, 1956) – IKONOMOV 1986.

Marthamea vitripennis (Burmeister, 1839) – ZWICK 1984.

Perla abdominalis Burmeister, 1839 – IKONOMOV 1986: as „*Perla burmeisteriana* Classen, 1839", MURÁNYI *et al.* 2014, 2016 – Southeastern region, Belasica Mts, Bašibos, Karani Stream, NE of the village, 400 m, N41°19.076', E22°42.434', 04.10.2017, JP, KT, MD, 1L, (MM).

Perla bureschi Schoenemund, 1926 – Southeastern region, Plačkovica Mts, forest brook beneath by Beli Kamen, 1335 m, N41°44.672', E22°30.356', 05.10.2017, JP, KT, MD, 2L, (MM). – First record from North Macedonia. It was described from Bulgaria, and recently reported from Serbia (MURÁNYI & KOVÁCS 2024).

Perla illiesi Braasch et Joost, 1971 – IKONOMOV 1986.

Perla marginata Panzer, 1799 – IKONOMOV 1986, BEADINI *et al.* 2014, TYUFEKCHIEVA & RIMCHESKA 2019.

Perla pallida Guérin-Méneville, 1838 – IKONOMOV 1986, SIVEC & STARK 2002.

Perla cf. pallida Guérin-Méneville, 1843 – MURÁNYI *et al.* 2014, 2016, 2021. – Eastern region, Plačkovica, Gradec, Gradec Stream above the village, 590 m, N41.843095°, E22.505991°, 19.10.2006, DL, KJ, MD, 2L, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 02.10.2013, KT, MD, 2L, (HNHM); 25.06.2014, JP, KT, MD, 1♂, 1♀, (HNHM); 07.05.2014, KT, MD, 2L, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 07.05.2014, KT, MD, 1L, 1♂, (HNHM), 1E, 2♀, (MM) – Pelagonia region, Pelister Mts, spring area of Ezerska Stream beneath Golemo Ezero, 2200 m, N40°58.142', E21°12.431', 03.10.2017, JP, KT, MD, 1L, (HNHM), 9L, (MM) – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 27.04.2021, KT, MD, OP, 8L, (MM) – Polog region, Reka, Vrben, stream in the village, 1285 m, N41.72263°, E20.73626°, 16.05.2010, FZ, MD, UZs, 1L, (HNHM) – Polog region, Šar Planina, Bozovce, forest stream above the village, 1600 m, N42.04665°, E20.79376°, 26.04.2021, KT, MD, OP, 5L, (MM) – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 3♂, (HNHM), 2♂, 2♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 2♂, 4♀, (HNHM), 1♂, 3♀, (MM) – Polog region, Šar Planina, Bozovce, open stream above the village, 1750 m, N42.05023°, E20.78765°, 26.04.2021, KT, MD, OP, 4L, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1L, 1♂, 1♀, (HNHM),

1L, 4♂, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 2♂, 1♀, (EKCU), 2L, 1E, 1♂, 4♀, (MM) – Polog region, Šar Planina, Vešala (Veshallë), open, rocky stream at the village, 1290 m, N42°03.865', E20°50.866', 01.10.2013, KT, MD, 2L, (HNHM), 4E, (MM) – Polog region, Trnica, Mavrovska Stream below the village, 955 m, N41.71717°, E20.67708°, 27.04.2021, KT, MD, OP, 1L, (MM) – Southeastern region, Belasica Mts, Bašibos, Činarli Stream N of the village, 355 m, N41°19.050', E22°41.983', 04.10.2017, JP, KT, MD, 1E, (HNHM) – Southeastern region, Belasica, Kolešino, Kolešino Waterfall, 460 m, N41.369453°, E22.806991°, 18.10.2006, DL, KJ, MD, 1L, (HNHM) – Southwestern region, Brežani, Golema Stream above the village, 1040 m, N41°15'49.6", E20°57'43.0", 27.06.2024, AA, HK, KT, 1♀, (MM) – Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, 1905 m, N41°16.069', E20°31.242', 26.06.2014, JP, KT, MD, 1♂, (HNHM), 1L, (MM) – Southwestern region, Plakenska Planina, Brežani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 1L, (MM); 27.06.2024, AA, HK, KT, 3E, 4♂, 3♀, (MM) – Southwestern region, Plakenska Planina, Brežani, Golema Stream, 1105 m, N41.25366°, E20.96785°, 01.05.2021, KT, MD, OP, 1L, (MM) – Southwestern region, Velmej, Gorni Istok Spring and its outlet, 865 m, N41°16'44.9", E20°55'06.5", 27.06.2024, AA, HK, KT, 5L, 2♂, 1♀, (MM) – Vardar region, Jakupica Mts, Papradiste, forest brook at the village, 970 m, N41°38.393', E21°26.359', 03.10.2013, KT, MD, 1L, (HNHM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 2L, (HNHM). – *Perla pallida* was currently redescribed from the Caucasus, and probably restricted to the Caucasus and Anatolia (TESLENKO *et al.* 2024). All the above specimens are different from the redescription, and must receive new name or names. The nomen dubium *Perla stankovici* Šamal, 1935 was described from the North Macedonian part of the Korab Mts, the name should be applied for the corresponding populations - however, the types are lost and the concept of the species must be re-established on the basis of topotypes.

PERLODIDAE Klapálek, 1909

Arcynopteryx dichroa (McLachlan, 1872) – IKONOMOV 1986: as „*Arcynopteryx compacta* (McLachlan, 1872)” – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 03.10.2017, JP, KT, MD, 6L, (HNHM).

Besdolos illyricus Kovács & Zwick, 2008 – Polog region, Bistra, Mavrovo, stream above the village, 1280 m, N41.64732°, E20.74196°, 27.04.2021, KT, MD, OP, 2L, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 2♀, (MM) – Polog region, Šar Planina, Veshala, Pena River beneath the village, 1100 m, N42.05821°, E20.84985°, 26.04.2021, KT, MD, OP, 4L, (MM) – Southwestern region, Plakenska Planina, Brežani, Golema Stream, 1040 m, N41.26378°, E20.96193°, 01.05.2021, KT, MD, OP, 5L, (MM). – New for the fauna of North Macedonia. Hitherto it was known only from Montenegro and Albania.

Besdolos ventralis (Pictet, 1841) – ZWICK & WEINZIERL 1995.

Isopterla albanica Aubert, 1964 – IKONOMOV 1986, RUŠITI-DAUTI *et al.* 2024.

Isopterla belai Illies, 1963 – IKONOMOV 1986.

Isopterla bosnica Aubert, 1964 – RUŠITI-DAUTI *et al.* 2024 – Previous records were questionable, see MURÁNYI 2011.

Isopterla breviptera Ikononov, 1980 – IKONOMOV 1986.

Isopterla buresi Raušer, 1962 – IKONOMOV 1986.

Isopterla citrina Murányi, 2011 – MURÁNYI *et al.* 2016 – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 03.10.2017, JP, KT, MD, 1♂, (HNHM), 2♂, 1♀, (MM) – Polog region, Bistra, Mavrovo, spring brooks above the village, 1285 m, N41.64724°, E20.74124°, 27.04.2021, KT, MD, OP, 2L, (EKCU) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♂, 3♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♂, 1♀, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 1♂, 2♀, (MM).

Isopterla grammatica (Poda, 1761) – IKONOMOV 1986, TYUFKCHIEVA & RIMCHESKA 2019.

Isopterla oxylepis balcanica Raušer, 1962 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 1♂, (HNHM), 1♂, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♀, (MM).

Isopterla pesici Murányi, 2011 – MURÁNYI *et al.* 2014, TYUFKCHIEVA & RIMCHESKA 2019.

Isopterla russevi Sova, 1970 – IKONOMOV 1986

Isopterla cf. russevi Sova, 1970 – Southeastern region, Belasica Mts, Bašibos, Anska River at Kočuli settlement, 310

m, N41°18.658', E22°41.717', 05.05.2014, KT, MD, 1♀, (MM). – A large sized species, close to *Isopterla russevi* but probably different; see MURÁNYI & KOVÁCS 2024, first record from Serbia.

Isopterla submontana Raušer, 1965 – IKONOMOV 1986

Isopterla tripartita tripartita Illies, 1954 – IKONOMOV 1986

Isopterla cf. *tripartita* Illies, 1954 – MURÁNYI *et al.* 2016, 2021 – Greater Skopje, Skopje, 06.1969, P. Ikononov, 2♂, 2♀, (HNHM) – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 03.10.2017, JP, KT, MD, 7 ♀, (MM) – Pelagonia region, Pelister Mts, Capari, spring area of Caparska Stream, 1955 m, N41°00.227', E21°10.075', 13.09.2016, JP, KT, SzG, 1♂, (MM) – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 25.06.2014, JP, KT, MD, 1E, 4♂, 2♀, (HNHM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 25.06.2014, JP, KT, MD, 7♂, 4♀, (HNHM), 5♂, 1♀, (MM) – Pelagonia region, Pelister Mts, spring area of Ezerska Stream beneath Golemo Ezero, 2200 m, N40°58.142', E21°12.431', 03.10.2017, JP, KT, MD, 1♂, 3♀, (MM) – Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 3♂, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 5♂, 5♀, (MM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 2L, 3♂, 1♀, (HNHM), 10♂, 5♀, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 2♂, 7♀, (MM) – Southwestern region, Brežani, Golema Stream above the village, 1040 m, N41°15'49.6", E20°57'43.0", 27.06.2024, AA, HK, KT, 3♀, (MM) – Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, 1905 m, N41°16.069', E20°31.242', 26.06.2014, JP, KT, MD, 7L, 4♂, (HNHM), 3L, 7♂, 1♀, (MM) – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♂, (MM) – Southwestern region, Plakenska Planina, Brežani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 27.06.2024, AA, HK, KT, 1♂, 9♀, (MM) – Southwestern region, Velmej, Gorni Istok Spring and its outlet, 865 m, N41°16'44.9", E20°55'06.5", 26.06.2024, at light, AA, HK, KT, 5♂, 2♀, (MM) – Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, 1660 m, N41°12.565', E22°13.158', 25.06.2014, JP, KT, MD, 1♂, (HNHM), 9♂, 4♀, (MM). – According to our recent concept, the real *Isopterla tripartita tripartita* is restricted to the Carpathian Basin and the surrounding East Alps and the Carpathians. All the Balkanian populations listed herein and in MURÁNYI 2011 will require further studies, including comparative morphological, molecular and bioacoustic studies.

Isopterla vevčianensis Ikononov, 1980 – IKONOMOV 1986, MURÁNYI *et al.* 2021.

Isopterla vjosae Graf & Vitecek, 2018 – RIMCHESKA & VIDINOVA 2021.

Perlodes dispar (Rambur, 1842) – IKONOMOV 1986.

Perlodes intricatus (Pictet, 1841) – IKONOMOV 1986 – Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, 935 m, N41°14.371', E20°35.056', 26.06.2014, JP, KT, MD, 1♂, 2♀, (HNHM), 1E, 1♂, 4♀, (MM); 07.05.2014, KT, MD, 9L, 1♂, (HNHM), 1L, 1♀, (MM); 10.10.2014, PG, 1E, (HNHM) – Southwestern region, Jablanica, Vevčani, forest stream, 1190 m, N41.23257°, E20.57229°, 28.04.2021, KT, MD, OP, 1♂, (EKCUCU).
Perlodes microcephalus (Pictet, 1833) – IKONOMOV 1986.

CHLOROPERLIDAE Okamoto, 1912

Chloroperla kosarovi Braasch, 1969 – IKONOMOV 1986 – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 1♂, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 5♂, 2♀, (MM).

Chloroperla russevi Braasch, 1969 – IKONOMOV 1986.

Chloroperla tripunctata (Scopoli, 1763) – IKONOMOV 1986, TYUFEKCHIEVA & RIMCHESKA 2019.

Siphonoperla graeca (Aubert, 1956) – IKONOMOV 1986: as „*Siphonoperla neglecta graeca* Aubert, 1956”.

Polog region, Šar Planina, Bozovce, forest stream W of the village, 1565 m, N42°02.755', E20°47.723', 24.06.2014, JP, KT, MD, 1♂, 5♀, (HNHM).

Siphonoperla neglecta (Rostock, 1881) – IKONOMOV 1986, BEADINI *et al.* 2014, MURÁNYI *et al.* 2016, TYUFEKCHIEVA & RIMCHESKA 2019 – Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, 1370 m, N40°58.889', E21°15.246', 25.06.2014, JP, KT, MD, 6♂, 6♀, (HNHM), 1♂, 2♀, (MM) – Pelagonia region, Pelister Mts, Nižepole, open brook at the ski station, 1375 m, N40°58.787', E21°15.218', 25.06.2014, JP, KT, MD, 1♂, 5♀, (HNHM), 3♂, 1♀, (MM) – Polog region, Šar Planina, Bozovce, open brook W of the village, 1545 m, N42°02.759', E20°47.776', 24.06.2014, JP, KT, MD, 1♂, 2♀, (HNHM) – Polog region, Šar Planina, Bozovce, open stream, brook W of the village, 1880 m, N42°03.147', E20°46.920', 24.06.2014, JP, KT, MD, 5♂, (HNHM), 6♂, (MM) – Polog

region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, 980 m, N42°03.375', E20°53.561', 24.06.2014, JP, KT, MD, 2♂, (MM) – Polog region, Šar Planina, Popova Shapka, open stream above the village, 1818 m, N42°01'09.1", E20°52'47.1", 25.06.2024, AA, HK, KT, 1♂, 5♀, (MM) – Southwestern region, Plakenska Planina, Brezani, forest brook, 1135 m, N41°15'8.6", E20°58'2.6", 01.05.2021, KT, MD, OP, 5L, (MM) – Vardar region, Kožuf Mts, open and forest brooks towards Ski Kožuf, 1610 m, N41°11.968', E22°13.550', 06.05.2014, KT, MD, 3♂, 1♀, (MM) – Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, 1660 m, N41°12.565', E22°13.158', 25.06.2014, JP, KT, MD, 3♂, (MM).

Siphonoperla korab Graf, 2012 – GRAF *et al.* 2012.

Siphonoperla transsylvanica Kis, 1963 – IKONOMOV 1986.

Siphonoperla torrentium torrentium (Pictet, 1841) – Southeastern region, Belasica Mts, Bašibos, Anska River at Kočuli settlement, 310 m, N41°18.658', E22°41.717', 05.05.2014, KT, MD, 1♀, (MM).

Discussion

This paper provides 455 data of 63 taxa from 90 sampling sites between 06.1969 and 27.06.2024. *Zwicknia ephemera* sp. n. is described as a new species, while *Brachyptera phthiotica*, *Leuctra digitata*, *Nemoura aetolica*, *N. braaschi*, *Perla bureschi* and *Besdolus illyricus* are firstly reported from North Macedonia. Eleven taxa of uncertain taxonomical value are reported as confer taxa (*Leuctra* cf. *mortoni*, *L.* cf. *pseudosignifera*, *Nemoura* cf. *bulgarica*, *N.* cf. *flexuosa*, *N.* cf. *peristeri*, *Protonemura* cf. *autumnalis*, *P.* cf. *illiesi*, *P.* cf. *nitida*, *Perla* cf. *pallida*, *Isoperla* cf. *russevi*, *I.* cf. *tripartita*). Together with the 11 confer taxa, there are 123 species/subspecies reported with adequate faunistic data from North Macedonia. In addition to the taxa questioned by MURÁNYI *et al.* (2014), further two Alpine species are omitted from the list: *Leuctra leptogaster* Aubert, 1949 and *Protonemura nimborella* Moseley, 1930. There are eight species hitherto known only from North Macedonia: *Brachyptera macedonica* (southeastern ranges), *Capnioneura valandovi* (southeastern ranges), *Isoperla breviptera* (Šar Planina), *Nemoura peristeri* (Pelister Mts), *Protonemura miatchense* (eastern and northern ranges), *Siphonoperla korab* (Korab Mts), *Taeniopteryx fusca* (Šar Planina) and *Zwicknia ephemera* (Valandovsko Polje). Besides these eight species, 48 further taxa can be considered as Balkanian endemics. Some characteristic North Macedonian species are depicted on Figs 11–14.





Fig. 11. *Brachyptera graeca* Berthélemy, 1971; **Fig. 12.** *Taeniopteryx fusca* Ikonomov, 1980; **Fig. 13.** *Nemoura caligula* Zwick, 1978; **Fig. 14.** *Nemoura peristeri* Aubert, 1963 (photos: 11–13 – D. Murányi, 14 – T. Kovács)

Acknowledgements: Thanks are due to Péter Olajos (BioAqua, Debrecen) for preparing the map, and to Ádám Kiss (MM, Gyöngyös) for editing Figs 2–8. We are also indebted to the colleagues who took part in our collectings, they are listed in the Material and methods or in the list of data. The 2013 October and 2014 May trips were supported by János Oláh (Sakertour, Debrecen).

References

- BEADINI S., BEADINI N., ABDIJA X. & RUSHITI A. (2014): Taxonomy, horology and ecology of Plecoptera (Insecta, Plecoptera) of the Sharr Mountain Massif. – *Universi*, 1(1): 1–7.
- BOUMANS L. & MURÁNYI D. (2014): Two new species of *Zwicknia* Murányi, with molecular data on the phylogenetic position of the genus (Plecoptera, Capniidae). – *Zootaxa*, 3808(1): 1–91. <https://doi.org/10.11646/zootaxa.3808.1.1>
- GRAF W., POPOJAČ A., PREVIŠIĆ A., GAMBOA M. & KUČINIĆ M. (2012): Contribution to the knowledge of Siphonoperla in Europe (Plecoptera: Chloroperlidae): *Siphonoperla korab* sp. n. – *Zootaxa*, 3164(1): 41–48. <https://doi.org/10.11646/zootaxa.3164.1.4>
- IKONOMOV P. (1986): Plécoptères de Macédoine (Insecta, Plecoptera). *Taxonomie et Distribution*. – *Acta Musei macedonici scientiarum naturalium*, 18(4): 81–124.
- KOVÁCS T., AMBRUS A., BÁNKUTI K. & JUHÁSZ P. (1998): New Hungarian mayfly (Ephemeroptera) species arising from collectings of larvae. – *Miscellanea zoologica hungarica*, 12: 55–60.
- MURÁNYI D. (2007): New and little-known stoneflies (Plecoptera) from Albania and the neighbouring countries. – *Zootaxa*, 1533(1): 1–40. <https://doi.org/10.11646/zootaxa.1533.1.1>
- MURÁNYI D. (2011): Balkanian species of the genus *Isoperla* Banks, 1906 (Plecoptera: Perlodidae). – *Zootaxa*, 3049(1): 1–46. <https://doi.org/10.11646/zootaxa.3049.1.1>
- MURÁNYI D. & KOVÁCS T. (2024): Contribution to the Plecoptera fauna of Serbia. – *Folia Historico-Naturalia Musei Matraensis*, 48: 21–35.
- MURÁNYI D., KOVÁCS T., GAMBOA M. & WATANABE K. (2021): Loss of a larval generic character: a new description for *Isoperla vevcianensis* Ikonomov, 1980 (Plecoptera: Perlodidae) with updated adult characters. – *Zootaxa*, 5082(6): 541–552. <https://doi.org/10.11646/zootaxa.5082.6.2>
- MURÁNYI D., KOVÁCS T. & ORCI K. M. (2014): New country records and further data to the stonefly (Plecoptera) fauna of southeast Macedonia. – *Ecologica Montenegrina*, 1(2): 64–77. <https://doi.org/10.37828/em.2014.1.9>
- MURÁNYI D., KOVÁCS T. & ORCI K. M. (2016): Contribution to the taxonomy and biology of two Balkan endemic *Isoperla* Banks, 1906 (Plecoptera: Perlodidae) species. – *Zoosymposia*, 11: 73–88. <https://doi.org/10.11646/zoosymposia.11.1.11>

- RIMCHESKA B. & VIDINOVA Y. (2021): Filling gaps in the DNA barcode library - aquatic insects (Ephemeroptera, Plecoptera, Trichoptera) from semi-mountainous and mountainous rivers of Ecoregion 6 (North Macedonia). – ARPHA Conference Abstracts, 4: e65053. <https://doi.org/10.3897/aca.4.e65053>
- RUŠITI-DAUTI A., SLAVEVSKA-STAMENKOVIĆ V., SIVEC I., IBRAHIMI H., ISENI G., BILALLI A., CVETKOVSKA-GJORGJIEVSKA A. & HINIČ-JORDANOVSKA J. (2024): New records of stoneflies (Insecta: Plecoptera) in National Park Shar Mountain (R. North Macedonia). – *Ecologica Montenegrina*, 75: 190–199. <https://doi.org/10.37828/em.2024.75.18>
- SIVEC I. (1980): Plecoptera. *Catalogus Faunae Yugoslaviae*, Ljubljana, 3(6): 1–30.
- SIVEC I. & STARK B. P. (2002): The species of *Perla* (Plecoptera: Perlidae): evidence from egg morphology. – *Scoptolia*, 49, 1–33.
- ŠÁMAL J. (1935): Nový druh Pošvatky z Balkánu. New stonefly-species from Balcan-Peninsula. – *Acta Societatis Entomologicae Czechosloveniae*, 32: 84–87.
- TESLENKO V. A., PALATOV, D. M. & SEMENCHENKO A. A. (2024): Overview of the Caucasian *Perla* Geoffroy, 1762 (Plecoptera: Perlidae) based on morphological and molecular data with description of two new species. – *Zootaxa*, 5507(1): 1–56.
- TYUFEKCHIEVA V. G. & RIMCHESKA B. J. (2019): Composition and zoogeographic features of the stonefly fauna (Insecta: Plecoptera) of mountainous and semi-mountainous streams in Aegean watershed (7th Ecoregion, Eastern Balkans). – *Ecologia Balkanica*, 2: 91–106.
- VINÇON G. & MURÁNYI D. (2007): *Leuctra dalmoni*, a new orophilic species with wide distribution in Europe (Plecoptera). – *Nouvelle Revue d'Entomologie*, 23(3): 237–248.
- VINÇON G., RAVIZZA C., RAVIZZA DEMATTEIS E. & REDING J.-P. G. (2024): Orophilic and crenophilic stoneflies (Insecta: Plecoptera) of the Italian region: new species, nomenclatural changes, updated and annotated checklist. – *Opuscula Zoologica Budapest*, 55(Suppl.1): 1–98.
- ZWICK P. (1984): *Marthamea beraudi* (Navás) and its European congeners (Plecoptera: Perlidae). – *Annales de Limnologie*, 20 (1–2): 129–139. <https://doi.org/10.1051/limn/1984005>
- ZWICK P. & WEINZIERL A. (1995): Reinstatement and revision of genus *Besdolus* (Plecoptera: Perlodidae). – *Entomologica Scandinavica*, 26: 1–16.

Dávid MURÁNYI
 Department of Zoology
 Eszterházy Károly Catholic University
 H-3300 Eger, Hungary
 Leányka utca 6
 Department of Agrochemistry and Plant Protection
 Samarkand State University named after Sharof Rashidov
 140104 Samarkand, Uzbekistan
 University Boulevard
 E-mail: d.muranyi@gmail.com

Tibor KOVÁCS
 Mátra Museum of the Hungarian Natural History Museum
 of the Hungarian National Museum Public Collection Centre
 H-3200 Gyöngyös, Hungary
 Kossuth Lajos utca 40
 E-mail: koati1965@gmail.com